Matrix Mapping: A Simple Graphical Representation of Hierarchy Structure in Clinical Vocabularies

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A simple graphical model applicable to clinical vocabulary hierarchy structures has been developed as an adaptation of semantic indexing methods following attributed definition of clinical concepts. The technique and its potential applications are described.

TECHNIQUE

A frame-based characterisation is performed to assign attributed definitions to concepts from the vocabulary. Based on these semantic characterisations an adaptation of semantic indexing[1] is then utilised in which a matrix is constructed to represent the attributes as columns and the concepts as rows. A map of the K34 category of OPCS4[2] is illustrated in figure 1. Shaded cells in the table depict the occurrence of one or more new characteristics in a subordinate concept. The resulting matrix is, therefore, a graphical simplification of the entries in the frame and enables identification of semantic types represented (but not the specific attributed values).

APPLICATION

This method provides a model which can be used to illustrate a range of features of clinical vocabulary hierarchy construction:

- In a directed acyclic graph the introduction of characteristics during descents from a high level node to lower nodes via different arcs may be demonstrated.
- Diffusion of non-axial characteristics in a uniaxial structure can be readily visualised.
- Hierarchical integrity can be tested, in particular the inappropriate location of concepts in a subtype hierarchy.
- Underlying hierachy structures may be compared for different vocabularies by evaluation of congruence between matrices.

References

1. Chute CG, Yang Y, Evans DA. Latent semantic indexing of medical diagnoses using UMLS semantic structures. In: Clayton PD (Ed). *Proceedings of the Fifeenth Annual Symposium on Computer Applications in Medical Care.* New York: McGraw Hill, 1992: 185-9.

2. Classification of surgical operations and procedures (4th revision). Office of Population Censuses and Surveys. London: HMSO, 1990.

K34	S	A	D	P	C	Other open operations on valve of heart
K34.1	■		■			Annuloplasty of mitral valve
K34.2	■		■			Annuloplasty of tricuspid valve
K34.3			■		■	Annuloplasty of valve of heart nec
K34.4			■	■		Excision of vegetations of valve of heart
K34.8					■	Other specified
K34.9					■	Unspecified

Key: S = anatomical site; A = approach; D = surgical deed; P = pathology; C = formal classification characteristic.
The characteristics of the superordinate concept (K34) are site (*heart valve*), access (*open*) and a classification atom (*other*). Categories K34.1 and K34.2 introduce more detailed sites (*mitral* and *aortic*) and also the deed (*annuloplasty*). Category K34.3 has no further specification of site but does specify an action and that the valve should not be elsewhere classified. Category K34.4 introduces a different action (*excision*) and a pathological process (*vegetations*) but with no further specification of site. Categories .8 and .9 are residual.

Figure 1: Matrix map for K34 category of OPCS4 (UK procedure classification).